Makerspaces and the School Library Part 1:

Where Creativity Blooms

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From puppets and video production to art exhibits and science demonstrations, the library has always been a place to create and share ideas. In the past decade, makerspaces have emerged as the latest re-imagination of libraries as places where creativity can bloom.

During the latest reiteration, the Maker Movement was first tied to science, technology, engineering, and mathematics (STEM) activities. However, as the Common Core Standards emerged, makerspaces became associated with a resurgence of interest in experiential, project-based approaches to learning. They can be linked with participatory learning, problem-solving environments, and inquiry-based learning, making them an excellent means to address the diverse needs of today's students along with Standards for the 21st Century Learner.

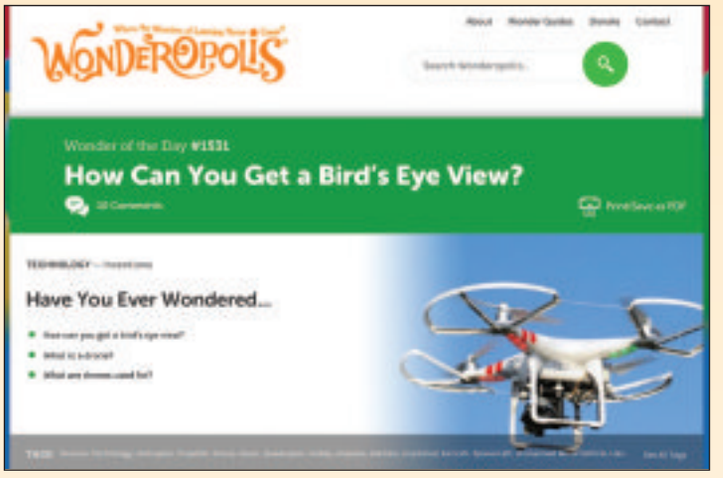
EXPAND MAKERSPACES WITH A DOZEN RESOURCES

Makerspaces provide youth with a place to imagine, design, create, construct, and express ideas. Both individual and collaborative products emerge as children tinker and invent. However, there's much more to creating a makerspace than emptying a corner of your library and filling it with cool supplies. Although you can let youth loose and watch them play, the experiences will be most beneficial if students possess background knowledge in the content area and skills in design and production that will help facilitate their exploration. The key is a learner-centered approach that puts students in the center of the action.

Let's explore a dozen categories of online resources and tools that can help jumpstart or expand your school library makerspace program.

CURIOSITY RESOURCES

Sometimes online resources can be used to stimulate curiosity and jumpstart maker projects. **Wonderopolis** <http://wonderopolis.org/wonders> is a website that uses questions to ignite interest. The inquiry pages contain text and images, along with ideas for youth to try out. The "Try It Out" ideas could become maker stations in your library.



Wonderopolis website

WonderBox <http://www.duckduckmoose.com/educational-iphone-itouch-apps-for-kids/wonderbox/> is an app for children that inspires curiosity and creative thinking. Students explore a topic, create a project, and share their conclusions with others.

Youth can imagine, invent, and engineer at the **Curiosity Machine** <https://www.curiositymachine.org/challenges/> website. For each project, youth follow the process of inspiring, planning, building, testing, redesigning, and reflecting.

DESIGN RESOURCES

Some websites help students develop skills in design and invention. For instance, PBS's **Design Squad Nation** <http://pbskids.org/designsquad> encourages youth to design, build, and test out their ideas.

Design Squad Nation

From fashion design to architecture, the **KidsThinkDesign** <http://www.kidsthinkdesign.org/> website explores careers and collaborations that involve deep thinking and design. Users learn about professionals in a field, explore key concepts, and try out fun design projects.

KidsThinkDesign website

PLANNING RESOURCES

Many websites help users plan projects. For instance, **Floor Planner** <http://www.floorplanner.com/> provides free basic tools that let users design homes. Some companies provide online simulations to explore their products. For instance, the **Sherman Williams Visualizer** <https://www.sherwin-williams.com/visualizer/> allows users to try out different paint colors on house interiors. Home Depot's **Color Center** <http://paintcolor.homedepot.com/tablet/> provides online tools and apps for interior design.

PATTERN RESOURCES

From sewing patterns to origami directions, many websites provide patterns and directions for creating projects that involve fabrics, papers, and other materials found in makerspaces.

Creating mechanical books is a popular makerspace activity. Many author websites provide patterns and directions for creating pop-up books. For instance, **David A. Carter's Pop-Up Books** <http://www.popup-books.com/surprise.html> website provides patterns for many pop-up book techniques. **Robert Sabuda's** < http://wp.robertsabuda.com/make-your-own-pop-ups/> website includes simple, intermediate, and advanced directions for making pop-ups.

Robert Sabuda's directions for a bee pop-up

GAME DESIGN RESOURCES

Gaming makerspaces are a favorite of middle and high school libraries. While some makerspaces focus on creating paper and board games, others stress computer programming and video game design. The **Gamekit Challenge Pack** <http://beta.gamek.it/challenge-pack/the-basics/> is a good place to start your exploration. It takes users step-by-step through the process of game building.

Gamekit Challenge Pack

Many websites provide tools for creating and hosting games. A few are listed below.

Blender http://www.blender.org/

Choice of Games https://www.choiceofgames.com

Game Salad https://gamesalad.com/

Gamemaker Studio http://www.yoyogames.com/studio

Gamestar Mechanic http://gamestarmechanic.com/

Pixel Press Floors http://www.projectpixelpress.com/floors/

Stencyl http://www.stencyl.com/

TextAdventures http://textadventures.co.uk/

Unity http://unity3d.com/unity/

While many youth are most interested in developing games, there's a growing interest in creating apps. The **App Inventor** <http://www.appinventor.org/> helps users build Android apps. For high school students, consider developing iPad apps. Learn more at the **Apple Developer** <https://developer.apple.com/ipad/> website.

CREATION RESOURCES

Technology tools can be used to create a wide range of products. For instance, 3-D printers have come down in cost and are particularly popular in libraries, because they can be shared school-wide. While technology teachers are interested in the programming side, many other educators—

such as industrial arts, home economics, and art teachers—are excited about the potential end products.

The **Thingiverse** <http://www.thingiverse.com/> website is an amazing place to look for project ideas and contests.

Thingiverse

Some examples of 3-D design programs include

AutoDesk 123D Design http://www.123dapp.com/

Blender https://www.blender.org/

OpenSCAD http://www.openscad.org/

MakerBot PrintShop https://itunes.apple.com/us/app/makerbot-printshop/id884304128?mt=8

Meshmixer http://www.meshmixer.com/

Sculptris http://pixologic.com/sculptris/

Tinkercard https://www.tinkercad.com/
SketchUp http://www.sketchup.com/

Some websites focus on specific 3-D applications such as the **Minecraft Print** <http://www.minecraftprint.com/> website that guides users through printing their 3-D Minecraft world designs.

PRINT COMMUNICATION RESOURCES

Print communications are a practical way to expand a maker program. Unfortunately, the costs of supplies for color printers remain high. Keep in mind that many communications can be shared electronically. For instance, **Weebly** <http://www.weebly.com/> is an easy-to-use tool for creating individual or class websites where communications could be shared. For class books, consider services like **Amazon's CreateSpaces** <https://www.createspace.com/>. You upload the e-book, then a student's family members can purchase it online if they wish.

Encourage students to use online tools to share their ideas, publish their works, persuade others, or teach. For instance, **Pixton** <https://www.pixton.com/> is a fun tool for creating comics. Students can print their comics or share them online.

For school libraries with mobile devices, consider apps like **Toontastic** <https://itunes.apple.com/us/app/toontastic/id404693282?mt=8>, **Book Creator for iPad** <https://itunes.apple.com/us/app/book-creator-for-ipad-create/id442378070?mt=8>, or **Buncee for Edu** <https://itunes.apple.com/us/app/buncee-for-edu/id923461057?mt=8>.

MULTIMEDIA COMMUNICATION RESOURCES

Set up an audio and video production makerspace. Include a green screen for video production and a Foley box of devices for generating sound effects. For ideas, go to **The Art of Foley** <http://www.marblehead.net/foley/specifics.html>. Consider incorporating puppets and other materials for interesting productions.

Many open source tools are available for recording and editing multimedia productions. For instance, **Audacity** <http://sourceforge.net/projects/audacity/> is a tool that can be downloaded for free.

Try incorporating app-based multimedia projects. Use **Adobe Voice** <https://itunes.apple.com/us/app/adobe-voice-show-your-story/id852555131?mt=8> to create animated videos and **Shadow Puppet** <https://itunes.apple.com/us/app/shadow-puppet-edu/id888504640?mt=8> to create simple videos.

From YouTube to Vine, there are endless websites where youth can share their video productions.

SIMULATION RESOURCES

It's not always realistic to provide youth with physical, hands-on experiences. In these cases, students can dive into simulated worlds involving nanotechnology, physics, or other fascinating topics. Design makerspaces in your library where youth can use computers to explore, design, and create.

Algodoo <http://www.algodoo.com/> is an app that allows youth to design, construct, and explore within the world of physics. **Monster Physics** <https://itunes.apple.com/us/app/monster-physics/id505046678?mt=8> is another physics project app for younger students.

The **Molecular Workbench** <http://mw.concord.org/modeler/> provides youth with hundreds of simulations that focus on physics, chemistry, biology, biotechnology, and nanotechnology. From simple machines to complex surgeries, students who use the **Edheads** <http://www.edheads.org/> website engage in virtual problem-solving activities. Students can explore a wide range of science projects at **PBS NOVA Labs** <http://www.pbs.org/wgbh/nova/labs/>. The PhET **Circuit Construction Kit** <https://phet.colorado.edu/en/simulation/circuit-construction-kit-dc> is just one of the many simulations that allow users to explore science concepts before trying them out in real-world situations.

PBS's NOVA Labs

Closely related to simulations are tutorial websites such as **How to Smile** <http://howtosmile.org/>. This website provides access to thousands of engaging science and math activities that can be connected with hands-on lessons and experiences. **CK-12** <http://www.ck12.org/> is another website that provides access to tutorials.

MAGAZINE RESOURCES

From **Highlights** <https://www.highlights.com/> to **Popular Mechanics** <http://www.popularmechanics.com/>, magazines are underused resources in the school library. Many magazines contain step-by-step craft projects, directions for DIY projects, and ideas for science projects. Although paper versions are still popular, consider accessing magazines on tablets in your makerspace.

Zinio <https://www.zinio.com> provides website and app-based approaches to electronic magazines and is available in many libraries. Also, use the magazine's website. For instance, the **Popular Science Magazine** website <http://www.popsci.com> has a Maker Faire section.

Make <http://makezine.com> is a magazine specifically focused on maker projects such as building a hovercraft using a 3-D printer. Keep in mind that older editions of magazines have lots of useful articles. Access these through your **EBSCO**, **Gale**, or **ProQuest** databases.

Many magazines focus on specific maker areas. For instance, **The MagPi** <https://www.raspberrypi.org/magpi/> magazine provides ideas related to Raspberry Pi, a low cost, credit-card sized computer that enables youth to experience computer programming. The magazine is available on the website, through apps, and as a paper magazine.

Make magazine

HOW-TO RESOURCES

Although experimentation and exploration can be great learning experiences, they are often time-consuming and frustrating for some learners. Use "how-to" websites to focus student energies on specific problems and projects. Probably the best known website for makerspace users is **Instructables** <http://www.instructables.com/>. **SparkFun** <https://learn.sparkfun.com> provides tutorials, videos, and products to get started on a wide range of projects.

Instructables website

The **Lawrence Hall of Science** <http://www.lawrencehallofscience.org/services_and_expertise/new_media> develops DIY apps that focus on a wide range of topics including nanotechnology and sun science. Each app describes the materials necessary and includes questions, instructions, and extension activities.

Also, explore video-based project instructions such as **Sylvia's Superawesome Maker Show** <http://sylviashow.com/>. Many YouTube channels focus on makerspace activities. Below are a few examples:

Craftzine https://www.youtube.com/user/craftzine

Make:Makezine.com https://www.youtube.com/user/makemagazine

Maker Bot https://www.youtube.com/user/makerbot

Maker Faire https://www.youtube.com/user/MakerFaireVideo

Youth who enjoy comics will love the **HowToons** <http://www.howtoons.com/> website. The resource provides comic-based instructions for a wide range of projects from pinewood derby cars to soda bottle rockets.

Howtoons

The **How Stuff Works** <http://www.howstuffworks.com/> website is useful for both "how-to" type projects as well as background information.

SPECIAL EVENT RESOURCES

One way to draw interest in your makerspace program is through special events. Start with a maker faire. For ideas, go to the **Maker Faire** <http://makerfaire.com/> website.

The **Global Cardboard Challenge** <http://cardboardchallenge.com/> is a cheap and easy special event. All you need to participate is access to cardboard.

The Global Cardboard Challenge

Involve youth in creating games and participating in **International Games Day** <http://igd.ala.org/>.

The **House of Code** <https://hourofcode.com> program is part of Computer Science Education Week, but it's an activity you can try year round.

The **Rube Goldberg** <https://www.rubegoldberg.com/education/contest/> contests are engaging ways to connect maker stations with fun challenges.

Many librarians use the Instructables website, so participating in the **Instructables Makerspace Contest** <http://www.instructables.com/community/Makerspace-Contest/> is a logical extension.

Many companies that produce 3-D printers, circuits, and other makerspace tools hold design challenges and contests. Winners receive equipment and other prizes. Check out the **Little Bits Electronics** <http://littlebits.cc/category/design-challenge-2> design challenges for ideas.

Sometimes a television program or video game can provide inspiration for your own promotion or challenge. For instance, the **Battlebots** <http://www.battlebots.com/> television show may inspire your students to host their own robotics competition. Or, the Mythbuster's site <http://www.discovery.com/tv-shows/mythbusters/> could be used as the basis for a "busted" challenge.

MAKERSPACES IN THE LIBRARY

Regardless of whether you're just getting started or you've been coordinating makerspaces for years, use online resources to extend the experience. Keep in mind that there are many ways to participate in the Maker Movement. The key is designing spaces and activities that best address the needs and interests of your students and teachers.